PATENT
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

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Application No.:	Unassigned	Art Unit: Unassigned
Filed:	January 29, 2001	Examiner: Unassigned
For:	NON-CIRCULAR, FLAT MOTOR AND MANUFACTURING METHOD THEREOF	

CLAIMS PENDING AFTER PRELIMINARY AMENDMENT

1. A non-circular flat motor comprising:

a rotor rotating about an axis aligned in an axial direction;

a housing which is non-circular in a plane perpendicular to the axial direction, which rotatably supports the rotor, and which has side surfaces, at least a part of which are flat; and

a plurality of feeder terminals arranged at the side surface at corners of the housing and electrically insulated from adjacent portions of the motor.

2. The motor as claimed in claim 1, wherein the housing includes a stator base and including an armature coil arranged at the stator base, and a magnet facing the armature coil and disposed on the rotor.

3. The motor as claimed in claim 2, wherein the housing is substantially rectangular in the plane and at least some of the feeder terminals do not protrude outward beyond sides of the housing.

4. The motor as claimed in claim 1, further comprising a flat magnet, a bracket as part of the housing and on which the magnet is disposed, a brush connected to the feeder

4. The motor as claimed in claim 1, further comprising a flat magnet, a bracket as part of the housing and on which the magnet is disposed, a brush connected to the feeder terminals across a first gap between the bracket and the magnet, wherein the rotor receives electric power via the brush and faces the flat magnet across a second gap in the axial direction.

5. The motor as claimed in claim 4, wherein a base end of the brush is part of the feeder terminal.

6. The motor as claimed in claim 4, wherein the housing is substantially rectangular in the plane and at least some of the feeder terminals do not protrude outward beyond the corners of the housing.

7. A non-circular flat motor comprising:

a rotor rotating about an axis aligned in an axial direction;

a housing including a stator base having a shaft for supporting the rotor centrally located on the stator base, the housing having a non-circular shape in a plane perpendicular to the axial direction, and being at least partially a resin; and

at least two feeder terminals arranged at a corner of the housing on a side surface of the housing, electrically insulating the feeder terminals from adjacent portions of the motor.

8. The motor as claimed in claim 7, wherein the shaft has a fixed shaft core extending from a portion of the housing constituting a stator, the shaft core having a resin coating, the rotor is rotatably installed on the resin coated fixed shaft, and a tip of the shaft is inserted in a concave portion of the housing.

9. The motor as claimed in claim 8, further comprising:

a magnetic yoke plate, the shaft core integrally protruding from the center of the magnetic yoke plate, constituting part of the housing;

a commutator;

a resin bracket including the resin coated, fixed shaft wherein the rotor includes the commutator;

a pair of brushes having free ends in sliding contact with the commutator and fixed such that at least two surfaces can expose base ends of the resin bracket portion through a brush recess portion;

and

an armature coil having one end connected to the commutator and rotatably arranged at the resin coated, fixed shaft, facing a magnet across a gap, wherein

the brush recess portion insulates at least one brush; and

the magnet is placed at a yoke portion of the resin bracket after the brushes are installed; and

a case accommodating the rotor and installed at the resin bracket, having a concave portion receiving the tip of the resin coated, fixed shaft at the center of the case, at least a magnetic path portion of the magnet being a magnetic body.

10. The motor as claimed in claim 9, wherein the magnet is separated from the yoke plate by a gap to enable reflow soldering.

11. The motor as claimed in claim 10, wherein the yoke plate is separated from the case except for a combined portion.

12. The motor as claimed in claim 11, wherein a portion for reflow soldering is not close to the combined portion.

13. The motor as claimed in claim 9, wherein the resin of the resin coated, fixed shaft includes potassium titanate whisker and withstands a thermal deformation temperature of over 200°C (18.5 kgf/cm^2) and is slippery.

14. A non-circular flat brushless motor comprising:

a metal plate incorporating a shaft support at a center, forming a first part of a housing;

a fixed shaft supported by the shaft support;

a rotor rotatably installed at a tip of the fixed shaft;

a stator including a plurality of armature coils arranged around the fixed shaft to drive the rotor; and

a second part of the housing supporting the tip of the fixed shaft.

15. The motor as claimed in claim 14, wherein the fixed shaft has a shaft core cut from a metal plate and the shaft core is coated with resin.

16. The motor as claimed in claim 14, including a pinion incorporated in the rotor.

17. The motor as claimed in claim 1, wherein the rotor is eccentric to generate vibrations during rotation.

18. The motor as claimed in claim 7, wherein the rotor is eccentric to generate vibrations during rotation.

19. The motor as claimed in claim 9, wherein the rotor is eccentric to generate vibrations during rotation.

20. A method of manufacturing a non-circular flat motor having brushes, the method comprising:

pressing a lead frame having a plurality of yoke plates arranged at a predetermined pitch by a connection portion;

inserting the yoke plates in an injection mold and molding a resin bracket in the mold;

detaching at least a connection portion of the yoke plates at respective connection portions;

installing the rotor on a fixed shaft for rotating; and

installing a case.

21. The method as claimed in claim 20, further comprising:

fixing brushes to the resin bracket by spot welding, the brushes having the same pitch as the yoke plates; and

installing a magnet on the yoke plate.